Research Note
Observations of Non-Compliance Behaviour by Tourists to a Voluntary Code of Conduct: A Pilot Study of Turtle Tourism in the Exmouth Region, Western Australia

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This paper reports on the results of a pilot study of observations of non-compliance behaviour by tourists to a voluntary code of conduct based on marine turtles attempting to nest in the Ningaloo Marine Park, Western Australia. The study used focal-animal sampling to record the response of marine turtles to non-compliance behaviour of tourist groups. Results of observations indicated that 77% of tourist groups breached the code of conduct, with 51% of these breaches resulting in a disturbance to marine turtles attempting to nest. The key aspects of the code of conduct that were breached included: shining light on the turtle; being closer than three metres from a turtle; and not staying behind the turtle at all times. The greatest disturbance to marine turtles was from tourists groups shining their torches on the turtles. This work demonstrates the need for further research into disturbance of turtles by tourists and the effectiveness of voluntary codes of conduct

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Introduction

Most wildlife tourism comprises a two-way interaction between humans and animals. Control over interactions is often exerted by managing the human component through the application of codes of conduct (Bauer & Dowling, 2003; Birtles *et al.*, 2004; Newsome *et al.*, 2002). Depending on the level of enforcement, coercion or other encouragement involved in their implementation, such codes of conduct can be used within the entire spectrum of management frameworks, from regulation to self-regulation. Codes of conduct, however, are usually voluntary, tend to be self-imposed and are designed to act as a form of self-regulation (Mason & Mowforth, 1996). Self-regulation or voluntary codes of conducts may be targeted at the industry (operators and guides) or at individual/groups of free independent travellers.

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Some research has indicated that even in the presence of tour operators, codes of conduct may not be adhered to (Scarpaci *et al.*, 2003; Sirakaya & Uysal, 1997). In particular, voluntary codes of conduct for free independent travellers have not been investigated. Furthermore, despite established programmes and the growing interest in turtle tourism there are limited studies that assess the issues surrounding unguided tourist viewing of nesting marine turtles (Dobbs, 2001; Lutz & Musick, 1997; Wilson & Tisdell, 2001). This study reports on observations of non-compliance behaviour by tourists to an existing code of conduct for turtle tourism and reports on how this behaviour affects the behaviour of marine turtles attempting to nest in the Jurabi Coastal Park in Western Australia.

Johnson *et al*. (1996) investigated the effects of organised turtle tours on the nesting behaviour of loggerhead turtles (*Caretta caretta*) and found that turtle watch groups influenced nesting behaviour by reducing the time taken for the turtle to complete the covering and camouflage phases of the nesting process. This was despite the tour groups following all components of the code of conduct developed by the Florida Department of Environmental Protection (FDEP). Johnson *et al*. (1996) concluded that organised turtle tours disturbed loggerhead turtles during the camouflage and returning phases of the nesting process. Other studies have suggested that unmanaged human visitation at night can cause turtles to abort nesting attempts (Fangman & Rittmaster, 1993; Jacobson & Lopez, 1994; Johnson *et al.*, 1996; Limpus & Reimer, 1990; Witherington, 1992).

Turtles are also known to be sensitive to light (Arianoutsou, 1988; McFarlane, 1963; Witherington, 1992), Mrosovsky (1978) suggests that intermittent flashes do not cause disturbance to turtles, yet constant use of light can influence turtle orientation. However, disturbances to marine turtles from light can be minimised through the use of low levels of short-wavelength lighting (Witherington, 1992). Most of the work has focused on the effects of lighting from street lights and coastal development, with limited reference to the effects of tourists using flashlights at night during the nesting period.

Some turtles abandon a nesting attempt if approached closely, although interrupted turtles may return on the same or subsequent night to lay in the absence of disturbance (Davis & Whiting, 1977; Talbert *et al.*, 1980). With consistent tourist activity over consecutive nights it is thought that continued presence of tourists on the beach may cause a shift in nesting locality (Jacobson & Lopez, 1994; Murphy, 1985), potentially to a less viable beach in terms of successful reproduction, and increase energetic costs as a result of increased nesting attempts (Lutz & Musick, 1997). Tagging studies and observations taken from Mon Repos Conservation Park in Queensland, Australia, indicate that habituation of nesting marine turtles occurs within the nesting season but not between seasons (Limpus, 2004). This is because marine turtles are generally more vulnerable to disturbance in the early periods of the nesting season possibly due to high hormone levels (Owens, 1997).

Management strategies and codes of conduct for human-marine turtle interactions are considered to be well established for nesting beach and egg laying situations (Hirth, 1997). Codes of conduct are used to reduce impacts at popular marine turtle tourism destinations such as in Australia, Costa Rica, Florida and Greece. However, Wilson and Tisdell (2001) suggest that the development of

existing codes of conduct is based on anecdotal evidence without any substantial scientific evaluation.

Turtle tourism at Exmouth, Western Australia

Western Australia is one of the few places in the world where there are large nesting populations of green (*Chelonia mydas*), loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*) and flatback turtles (*Natator depressus*) (Limpus, 2002; Prince, 1994). Under the *Environment Protection Biodiversity and Conservation Act 1999* (EPBC Act) the green, hawksbill and flatback turtles are considered vulnerable and the loggerhead is listed as endangered (Commonwealth of Australia, 1999). Every year, between November and March, female turtles nest on the beaches of the Ningaloo Marine Park. Waayers and Newsome (2003) have found that the northern mainland areas of the Ningaloo Marine Park comprise relatively important beaches in respect to both nesting of green turtles and tourist activity (Figure 1).

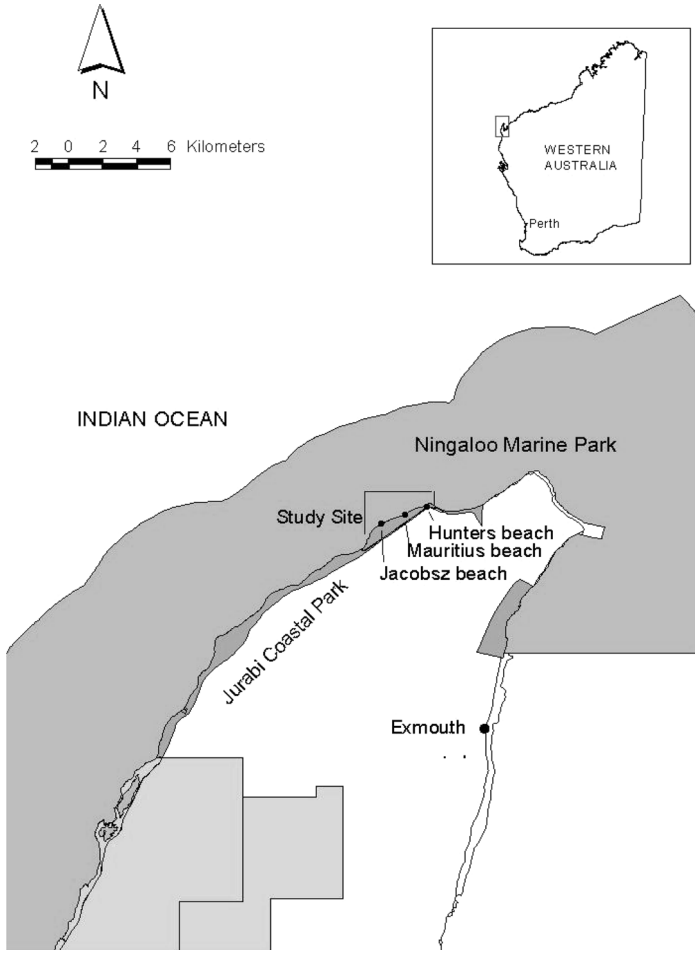

Figure 1 Study site

The potential for increased tourism has been forecast within the context of expanding the nature-based tourism product on the coast of the Ningaloo Marine Park (CALM, 2004). Turtle-based tourism has been considered as an off-peak alternative to other nature-based activities (focused along the coastline and in inland parts of the Cape Range National Park) that become less viable during the hot summer period. With the projected increase in visitation during this season, the Shire of Exmouth and the Department of Conservation and Land Management (CALM) have constructed a Turtle Visitor Centre in the Jurabi Coastal Park to facilitate this potential demand. The predictable seasonal nesting behaviour has led to the development of a small but expanding marine turtle tourism industry in the Jurabi Coastal Park in the northern region of the Ningaloo Marine Park (Figure 1). Total annual visitation doubled from 16,996 to 37,712 visitors between 1989 and 2001 (CALM, 2001). These increases have been attributed to a dramatic increase in visitation over the 'off-season' (October to February), which is also the nesting period for marine turtles in the Exmouth region.

Although some organised turtle tours occur in the area, the majority of human/marine turtle interactions are without guidance or supervision. This has raised concern that the growing marine turtle tourism industry in this region will have significant impacts on marine turtles and their nesting habitat. In response to these concerns, CALM has developed a code of conduct for unguided free-independent-travellers watching marine turtles attempting to nest at night (Table 1). This code of conduct was developed from a preliminary investigation into the impacts of marine turtle tourism on the beaches of the Jurabi Coastal Park (Osborne, 1995) and other codes of conduct used at Mon Repos, Costa Rica and Florida. The code of conduct developed by CALM is made available in a brochure, which has been distributed to appropriate tourism nodes. In addition signs have been erected at popular nesting beaches, including those beaches used in this study.

The aim of this pilot study was to establish whether turtles watched by tourists do behave in ways that indicate disturbance. This work therefore documents some preliminary observations on the interactions between tourists and green turtles in the Jurabi Coastal Park. Further objectives were to provide indicative

Table 1 The Department of Conservation and Land Management (CALM)'s voluntary code of conduct regulating unguided tourists in the Exmouth region

CALM's code of conduct for nesting marine turtles
1. Walk along the beach at high tide mark looking for tracks.
2. Do not approach or shine lights on turtles leaving the water or moving up the beach.
3. Avoid excess noise at all times.
4. Avoid sudden movement at all times.
5. Position yourself behind the turtle and stay low.
6. Avoid moving closer than 3 m to the turtle.
7. Wait until she is laying before moving closer, shining you torch or taking photos from behind.

data on tourist adherence to an existing code of conduct and to raise the question as to whether existing codes of conduct have an effect in preventing disturbances to marine turtles from turtle watching activities.

Methodology

Timing and location of study

The study was undertaken from November to February during the 2002/03 nesting season on three popular turtle watching beaches in the Jurabi Coastal Park covering a total of 3.4 km of nesting habitat: Hunters Beach; Mauritius Beach and Jacobsz Beach (from 21°49′E, 114°07′S to 21°49′E, 114°5′S), adjacent to the Ningaloo Marine Park in Western Australia (Figure 1). These beaches have been identified as being part of a significant mainland rookery within the Ningaloo region (Prince, 2000; Waayers & Newsome, 2003). University students (undertaking studies in wildlife tourism) were trained by the key researcher to observe and record tourist and turtle behaviour. In order to guarantee consistency in the collection of observational data, observers attended several training sessions in the field on marine turtle ecology and behaviour and in the collection of observational data of human/turtle interactions.

This pilot study contains no control studies or statistical testing as its objective was to test, in a small sample size, whether disturbance to turtles was actually taking place. Observations were scheduled between 8:00 pm and 12:00 midnight. A total of 172 tourist groups (comprising 2–10 people) were recorded visiting the beaches in order to view turtles. Observations of non-compliant behaviour of unguided tourist groups and responses of marine turtles are reported.

Observing groups interacting with turtles

A total of 96 groups were observed interacting with marine turtles attempting to nest. Here, an interaction is defined as a tourist group encountering and observing a marine turtle during the nesting process. Interactions were detected by observers utilising scanning observation techniques (Altman, 1974), which involved observers positioning themselves at a fixed vantage point (e.g. from the top of a dune) or by regularly patrolling the beach. Once an interaction was detected, an observer then accompanied and remained with the visitor group under observation.

A focal-animal sampling approach was used in combination with sequence sampling (Altman, 1974; Lehner, 1996) in order to observe the interaction sequence between humans and marine turtles attempting to nest. Sample sessions began at the onset of an interaction, whenever a visitor group encountered a turtle on the beach. The sample session sequence terminated after the turtle returned to the water or the group moved away from the turtle.

Recording turtle response to tourist behaviour

In order to detect disturbance in response to non-compliant human behaviour, this study recorded 'animal behavioural patterns' which are defined as linking two behavioural acts together into a reasonably predictable and stereotyped pattern (e.g. vigilance act followed by a disturbance behavioural response) (Delgardo & Delgardo, 1962; Lehner, 1996). The categories used to record the

pattern were based on agonistic behaviour types which are defined as behaviours associated with conflict, escaping and disturbance (Lehner, 1996; Scott, 1950).

In order to associate non-compliant behaviour by tourist groups with the corresponding disturbance, bouts of vigilance behaviour were initially observed. These vigilance behaviours were taken from Hailman and Elowson's (1992) ethnogram of nesting female loggerhead turtles and included: the prostrate pause; the head horizontal pause; and the head raised pause. The vigilance behaviours were not recorded but used to indicate the onset of a disturbance response. Disturbance responses were taken from previous studies that described the nesting processes of marine turtles (Bustard, 1972; Jacobson & Lopez, 1994; Lutz & Musick, 1997) and their reactions to various influences on the beach (Arianoutsou, 1988; Bustard, 1972; Hailman & Elowson, 1992; Jacobson & Lopez, 1994). The key disturbance behaviours include:

Table 2 Definitions of non-compliance behaviour by tourist groups and disturbance behaviours of marine turtles

Behaviour	*Definition*
Non-compliance behaviour by tourists	
1. Not walking along the high tide mark	Groups walking 5 m above the high tide mark and landward
2. Making loud noise	Groups speaking above the normal volume (i.e. not whispering)
3. Shining torchlight at turtles	Groups shining their torchlight directly onto the turtle
4. Sudden movements	Groups exhibiting rapid movements (e.g. running, approaching quickly)
5. Not staying behind the turtle	Groups positioned on the sides or in front of the turtle
6. Staying three metres from the turtle	Groups within 3 m and behind the turtle
7. Using flash photography	Groups aiming their flash at the turtle whilst viewing the turtle
Disturbance behavioual reactions of marine turtles	
1. Turning back during emergence	Turtle makes a 180° turn during emergence and returns to the ocean
2. Aborting the body pit	Turtle terminates excavation of the body pit and crawls from the digging site
3. Aborting the egg chamber	Turtle terminates excavation of the egg chamber and crawls from the digging site
4. Aborting laying her eggs	Turtle terminates oviposition and crawls from the nesting site
5. Abort covering	Turtle terminates covering phase and returns to the ocean
6. Disturbance during returning	Turtle either changes the crawl direction or crawls faster

Note: All disturbance behaviours were signalled by a vigilance behaviour.

(1) turning back during emergence; (2) aborting the body pit; (3) aborting the egg chamber; (4) aborting laying her eggs; (5) aborting covering; and (6) disturbance during returning (Table 2).

Human behaviour was assessed and recorded using categories derived from the Department of CALM code of conduct for marine turtle interactions. Each aspect of the code was simplified to make clear distinctions between the various acts of non-compliance behaviour by humans. Seven aspects of the code of conduct were categorised and non-compliance was recorded in relation to position on the beach, distance from the turtle, torch-use, noise; movement, positioning near the turtle, and use of flash photography (Table 2).

Results

Seventy-seven percent of visitor groups (74 groups) interacting with turtles attempting to nest breached at least one component of the code ($n = 96$). Of these breaches, 57% of groups did not walk along the high tide mark, 33% of groups were shining their torch at the turtle, 32% were within three metres of the turtle, and 26% of groups did not remain behind the turtle (Figure 2).

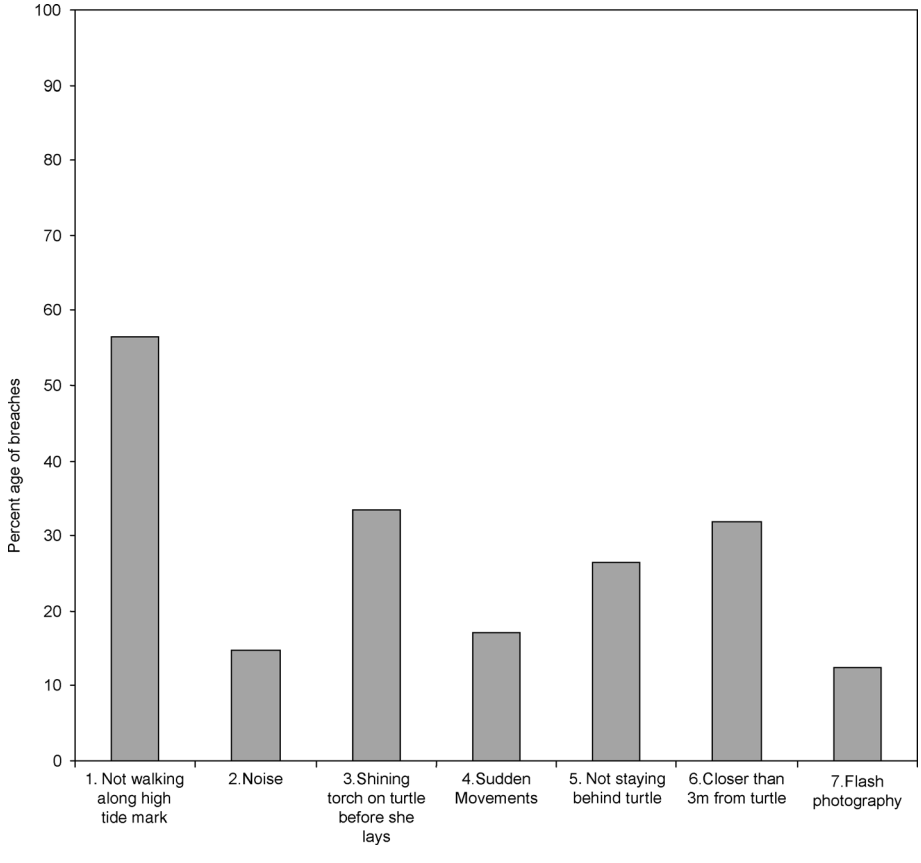

Figure 2 Percentages of various incidents of non-compliance behaviours (74 groups)

Table 3 Disturbance to marine turtles due to non-compliance visitor behaviour (74 groups)

Non-complaint behaviours by tourist groups	*Turning back during emergence*	*Aborting the body pit*	*Aborting the egg chamber*	*Aborting laying her eggs*	*Abort covering*	*Disturbance during returning*	*Total*
1. Not walking along the high tide mark	1	0	0	0	0	0	**1**
2. Making loud noise	0	0	0	0	0	0	**0**
3. Shining torchlight at turtles	9	2	3	0	2	3	**19**
4. Sudden movements	3	0	1	0	0	0	**4**
5. Not staying behind the turtle	3	1	1	0	1	3	**9**
6. Not staying 3 m from the turtle	2	5	1	0	0	0	**8**
7. Using flash photography	1	1	1	0	2	3	**8**
Total	**19**	**9**	**7**	**0**	**5**	**9**	**49**

Disturbance responses consisted of turtles turning back to the ocean during the emerging phase (total of 19), followed by aborting the body pit (9) and disruption during return to the ocean after oviposition (9) (Table 3). There was no observable disturbance during the egg-laying phase. Most of these disturbance responses were caused by tourist groups shining their torchlight directly onto the turtle during emergence from the sea (19), followed by tourist groups not staying behind the turtle during the egg laying phase (9), tourist groups not staying more than three metres from the turtle (8) and the use of flash photography (8) (Table 3).

Discussion

A previous study of human disturbance on marine turtles along the Jurabi coastline found that 33% of total interactions resulted in disturbance (Osborne, 1995). In comparison, this study has shown that in 51% of interactions where a breach of the code occurred there was some form of disturbance response. In particular there were four components of the code that were breached resulting in a relatively high level of disturbance. These are: (1) do not shine light on the turtle; (2) stay further than three metres from the turtle; (3) avoid sudden movement; and (4) stay behind the turtle at all times. Most of these disturbance occurred whilst turtles were emerging and excavating body pits and egg chambers.

Avoiding torch-use was considered the most influential component of the code in terms of reducing disturbance. This study has shown that most of the disturbance responses occurred when visitor groups shone their torchlight on turtles and used flash photography (Table 3). The data contained here also supports other studies that have investigated the influence of flashing sources of light on marine turtles (Lutcavage *et al.*, 1997; Salmon & Witherington, 1995; Witherington, 1992). Jacobson and Lopez (1994) suggest that without implementing the appropriate measures to reduce the disturbance of lights, nesting success could be reduced.

However, mitigating disturbance by restricting tourist groups at a distance can be ambiguous, particularly if the animal is moving in the direction of tourists. This study found that tourist groups that were closer than three metres caused the turtle to abort the body pit phase (Table 3). It can be argued that the application of a restricted distance may not be a useful component of the code because of the uncertain behaviour of animals in the wild. Therefore it may be more appropriate to emphasise the importance of movement and position of tourists, rather than specific distances. Studies have suggested that marine turtles, particularly green turtles, can be alarmed by moving shadows resulting in the abandonment of a nesting attempt (Bustard, 1972; Hailman & Elowson, 1992; Witherington, 1992). Although the results show little evidence of disturbance from not walking along the high tide mark whilst seeking a turtle (Table 3), this component of the code may help reduce disturbance to turtles contemplating a nesting attempt at a pre-emergence phase (Johannes & Rimmer, 1984).

The results of this study also indicate that noise made by humans apparently does not affect marine turtle nesting behaviour. This may be due to poor hearing ability while on land beacuse turtle auditory perception occurs

through a combination of bone and water conduction rather than air conduction (Lenhardt, 1994; Moein-Bartol *et al.*, 1999).

Most of the disturbance resulted in the turtles returning to the ocean during the emergence phase without laying eggs (Table 3). If disturbance, particularly torch-use, is repetative and continuous, marine turtles may shift to other beaches that are potentially less productive as nesting sites. This in the longer term could impact on the nesting population in the Exmouth region. Further research is therefore needed in determining whether these disturbances have the capacity to significantly affect the nesting capacity of Exmouth population.

Conclusion

This pilot study has shown that 77% of tourist groups breached the existing voluntary code of conduct that is designed to minimise disturbances to marine turtles on the beaches of the Exmouth region. However, a number of limitations need to be recognised in interpreting the results of this study. Any methodology that seeks to identify the impacts of tourism on wild animals has to take account of many factors. In this case the following issues are recognised as areas for study design and improving the accuracy of data collection and subsequent interpretation of any future work:

(1) Vigilance postures and the movements of turtles need to be compared in the presence of tourist groups and at control sites.
(2) Future studies should record turtle behaviour prior to and after being subject to visitor presence.
(3) Since the surveys were conducted at night observers may not have observed all behaviours and this may need to be taken into account when detecting vigilance behaviours.
(4) Requirement for a larger sample size to test for statistical significance.

Earlier in this paper it was noted that Wilson and Tisdell (2001) discuss the lack of scientific evaluation of codes of conduct. Despite the limitations presented above this study provides sufficient data to show that where the code of conduct is breached there is a 51% chance that the nesting turtle will be disturbed. Consequently, as there is some evidence that disturbance does occur this pilot study sets the scene for a more comprehensive scientific evaluation using a larger sample size and comparison with control sites where tourists are not present. Such an approach would more readily test and demonstrate that disturbances are attributable to non-compliance of the code by tourists.

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